M1A1 Tanks and Fragmentary Ammunition

by Gunnery Sergeant William J. Orr, USMC

The lethality, maneuverability, and shock effect of the M1A1 Abrams main battle tank is unparalleled throughout the world. When manned by a well-trained, aggressive crew, there are neither surfaces that it cannot overcome nor gaps that it cannot exploit. These strengths have been proven throughout several combat engagements, to include those most recently in Iraq. However, since these attributes are now known the world over, perhaps the Abrams' weakness could be classified by the way that the enemy chooses to defend against it. Potential adversaries are quickly learning, or have been studious of the lessons that others have learned, about the implications of facing one of these iron monsters head to head, tank versus tank. In future conflicts, the enemy will assemble in smaller antiarmor teams and will employ their weapons in a manner that uses maximum standoff capabilities. These teams will undoubtedly create a dilemma for the Abrams mostly because of the limitations of the main gun ammunition; the Abrams does not have the capability to effectively engage these area-type targets beyond the ranges of its machine guns. A high explosive fragmentary round will be required for the M1A1 Abrams to continue garnering success during future combat operations.

The main gun ammunition load of the M1A1 consists of 120mm rounds with armor-piercing, fin-stabilized discarding sabot (APFSDS), high-explosive antitank (HEAT), and/or high-explosive multipurpose antitank (MPAT), which are designed to destroy various antiarmor capable targets. Such targets include armored vehicles with powerful antitank (AT) armament, such as tanks and infantry combat vehicles, antitank guided missile (ATGM) systems, antitank infantry weapons, and attack helicopters fitted with ATGM systems. APFSDS (kinetic energy) is primarily used to defeat main battle tanks, while HEAT or MPAT (chemical energy) rounds with point initiating base detonating (PIBD) fuses are used to engage other antiarmor capable targets that often turn out to be more dangerous than combat vehicles and are more likely to appear on future battlefields. U.S. Marine Corps tankers experienced this more prominent threat during recent combat operations in Iraq.

The 1st Tank Battalion, 1st Marine Division, experienced the limitations of the MPAT round on multiple occasions during the 1st Marine Expeditionary Unit's

offensive operations in Iraq. The tank gunner asserts that he engaged a rocket-propelled grenade (RPG) team at a range of 2,000 meters in a bunker complex near the city of Al Kut with a MPAT round. He was surprised to find that immediately after the impact destroyed the bunker, several nearby Iraqi troops (within 30 meters) were able to stand and run from the site. As the troops fled to the north, passing other bunkers, additional soldiers joined in their retrograde. At their consolidation point, they culminated in a loosely dispersed group of approximately 30 soldiers. Again, the gunner engaged with MPAT, firing directly into the center of the troop mass, only to be further disappointed with the outcome. The blast concussion and the fragmentary effects of the MPAT were too negligible to produce his desired effect, which was target destruction.

When faced with an area target such as the one in this scenario, the Abrams main gun ammunition is deficient in its ability to inflict significant casualties. The high-explosive effect of chemical energy, shaped-charge projectiles will not always defeat every antiarmor capable target or troop mass. This is due to the physical characteristics of the shaped charge. Though effective in penetrating armor, the concentrated blast area formed during the contact initiation of the HEAT and/or MPAT projectile generally does not fragment antiarmor capable targets or troop masses located in or around the area of detonation. These characteristics would explain why the troops engaged were not destroyed.

Ammunition used by U.S. tanks in the not-so-distant past, such as the M60 series, had the capability of engaging area targets with the main gun. Based on lessons learned in the early years of the Vietnam War, several 105mm main gun rounds were developed. Among these are the M393A2 high-explosive plastic with tracer (HEP-T) and the M494 antipersonnel with tracer (APERS-T), rounds currently used by the Israeli Defense Forces (IDF). The HEP-T may be used against troops when blast concussion and fragmentation is desired.[1] It can be used against buildings and crew-served weapons emplacements at ranges beyond 2,000 meters. Additionally, HEP-T has a greater blast, concussion, and fragmentation effect than the current HEAT or MPAT rounds. APERS-T may be used against troops in the open at ranges from 200 to 4,400 meters. It consists of 5,000 subprojectiles (flechettes) that disperse in the target area. The round earns its "beehive" nomenclature due to the obvious swarming effect of the subprojectiles. The lethality of this round was recently demonstrated in the West Bank when an Israeli Defense Forces tank fired in a busy city center, killing eight and wounding over 100 people. The ratio of casualties inflicted related to the expense of ammunition was on the side of economy of force.

Other foreign militaries, namely the British, currently use a round that incorporates both features of the aforementioned rounds with their Challenger-series tanks. The 120mm high-explosive squash head (HESH) round has combined the plastic explosive advantages of the HEP-T and, to some degree, the fragmentary effects of the APERS-T. HESH uses shrapnel projectiles with an axial distribution method, thereby significantly improving the shape of the lethal radius and ensuring more effective engagement of antiarmor capable targets than the Abrams' HEAT or MPAT projectile. Additionally, this round can be fired in an indirect mode, similar to artillery rounds, giving the Challenger flexibility to reach the enemy beyond the tank's limited direct fire ranges. Additional information about the Challenger-series tanks and armaments is available at *http://www.janes.com/*.

The need for tanks to have fragmentary capability has long been recognized by Israel, a country that is currently fighting the types of battles that the U.S. is most likely to encounter in the future. To defeat targets, such as antitank teams, Israeli Military Industries have developed a 120mm APERS round and the more advanced antipersonnel, antimaterial (APAM) round. Each of these rounds contains six individually fused submunitions. Each submunition contains 500 tungsten cubes, and the case is scored internally to increase fragmentation. When fired in the antipersonnel mode, these submunitions are ejected over the top of the target, where they detonate sequentially, providing a unique top attack kill mechanism. When fired in the antimaterial mode, the fuse functions in a point detonating mode, and all six munitions detonate simultaneously, making it effective against bunkers and concrete walls. The round is also effective against light armored vehicles, and can penetrate over 25mm of rolled homogeneous armor (RHA) before the submunitions detonate, providing behind armor effects. This round is currently in use by the IDF.

Developing and fielding an M1A1 version of this 120mm high-explosive fragmentary round with the option of airburst fusing would considerably increase the effectiveness of fire against emplaced ATGM crews, AT grenade launcher operators, and hovering attack helicopters. It would also cover exposed manpower, personnel wearing body armor, and soft-skinned and lightly armored targets having a lower level of protection against top attack.

It is inevitable that U.S. forces will soon find themselves fighting a well-organized army in areas other than open, rolling terrain. In an area with potentially large troop concentrations and dense vegetation, such as a North Korea, fragmentary ammunition would be a force multiplier. It could only enhance the shock effect of the Abrams and inflict serious casualties on a massed enemy. During military operations in urban terrain (MOUT), this ammunition, coupled with the accuracy of the Abrams fire control system, could give the commander more flexibility for use of this on demand, direct fire artillery-like shell. In fact, the possibilities are nearly limitless when envisioning the uses of such ordnance with the Abrams main battle tank. Having the capability of fragmentation will ensure success of the M1A1 during all future operations.

Notes

[1]U.S. Army Field Manual, 3-20.12, *Tank Gunnery (Abrams)*, U.S. Government Printing Office, Washington, D.C., 5 May 1998.

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